US-PAT-NO: 6462835

DOCUMENT-IDENTIFIER: US 6462835 B1

TITLE: Imaging system and method

DATE-ISSUED: October 8, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Loushin; Robert S.	Eagan	MN	N/A	N/A
Peterson; Mark A.	River Falls	WI	N/A	N/A

APPL-NO: 09/ 353997

DATE FILED: July 15, 1999

PARENT-CASE:

This application claims priority from U.S. Provisional Application Ser. No. 60/092,867, filed Jul. 15, 1998, the entire content of which is incorporated herein by reference.

US-CL-CURRENT: 358/1.9, 358/506 , **382/167**

ABSTRACT:

A system and method for correction and reconstruction of digital color images make use of one or more of a set of algorithms for color calibration and correction, and reconstruction. An algorithm for optimized bit depth reduction

also can be used to match the response curve of the scanner to that of the scanned media, thereby improving signal-to-noise ratio and decreasing artifacts such as pixelization, which can result from sampling the tone curve too coarsely. In a photographic film application, in particular, a color calibration and correction algorithm enables correction of the image for variations in hue from film type to film type, over-exposure or under-exposure, exposure-induced hue shifts, hue shifts caused by lighting effects, processing related hue shifts, and other variables in film processing, while preserving overall hue of the subject matter in the originally photographed image. An image reconstruction algorithm allows creation of look-up tables (LUTs) that create a visually pleasing version of the image when applied to the original data.

34 Claims, 6 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

---------- KWIC ---------

Detailed Description Text - DETX (34):
The contrast of the final image can be adjusted by applying a contrast shaping curve, as shown in FIG. 4, as a separate look-up function, to the intermediate LUT. This step both suppresses overstretch and lends a more

aesthetically pleasing appearance to the image. As shown in FIG. 4, the rounded sections at the ends of the shaping curve tend to suppress pixelization, which typically occurs in the brightest or darkest regions of the image, and the higher slope in the center increases **midtone** contrast. The purpose of the contrast shaping function is to modify the nearly final LUT to achieve aesthetically pleasing results in the reconstructed image. Many possible functions could be used for the contrast shaping function. Included below is a discussion of an exemplary contrast shaping function. The contrast shaping function, in this example, can be represented by the following equation:

Detailed Description Text - DETX (36):

The constants s.sub.1 and s.sub.2 in the contrast shaping function are chosen to keep the output value between 0 and 1. Typically, constants s.sub.1 and s.sub.2 are chosen so that the lowest possible output value is 0 and the highest is 1. However, in some of the low contrast cases detected in the "limit stretch" step, they may be chosen so that the lowest possible output value is greater than 0 and/or the highest possible output value is less than 1. The constants m.sub.1 and m.sub.2 are chosen to control the slope of the curve, and therefore the contrast of the image, in the middle of the curve (corresponding to the **midtones** of the image) and the amount of curvature in the high and low values of the curve (corresponding to

the highlights and shadows
of the image). Increasing the curvature of the curve can cause it to have a
lower slope, and hence lower contrast, in selected areas of the image. This
can be useful for, among other things, minimizing the effects of pixelization
artifacts. In the example curve shown in FIG. 4, S.sub.1 =s.sub.2 =1/(2tan
h(0.5)) and m.sub.1 =m.sub.2 =1. It is not necessary that S.sub.1 equal
S.sub.2, or that M.sub.1 equal M.sub.2 ; they can be chosen separately.
S.sub.1 and M.sub.1 primarily affect the shape of the curve for low x values,
whereas S.sub.2 and M.sub.2 primarily affect the shape of the curve for high x
values.

Current US Cross Reference Classification - CCXR (2):

382/167